Water Quality Assessment
Gunnison River
City of Gunnison, Gunnison WWTF

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I. Water Quality Assessment Summary

Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.

Table A-1
WQA Summary

Facility Information			
Facility Name	**Permit Number**	**Design Flow (max 30-day ave, MGD)**	**Design Flow (max 30-day ave, CFS)**
City of Gunnison	CO0041530	4.2	6.5

Receiving Stream Information			
Receiving Stream Name	**Segment ID**	**Designation**	**Classification(s)**
Gunnison River	COGUUG14	Undesignated	Aquatic Life Cold 1 Recreation Class E Agriculture Water Supply

Low Flows (cfs)			
1E3 (1-day)	**7E3 (7-day)**	**30E3 (30-day)**	**Ratio of 30E3 to the Design Flow (cfs)**
107	144	179	28:1

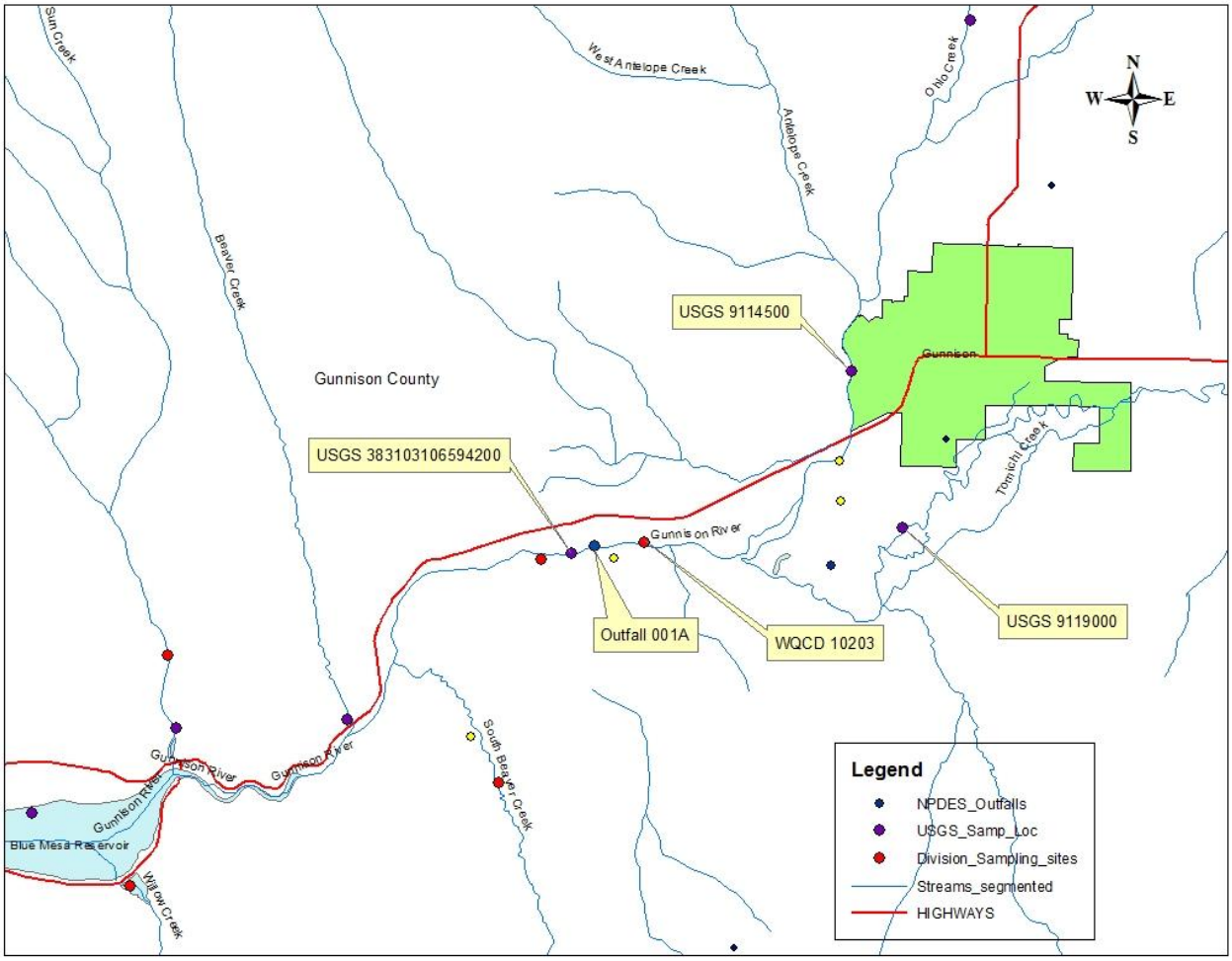
Regulatory Information					
T&E Species	**303(d) (Reg 93)**	**Monitor and Eval (Reg 93)**	**Existing TMDL**	**Temporary Modification(s)**	**Control Regulation**
No	None	None	No	None	None

Pollutants Evaluated
Ammonia, *E. Coli*, TRC, Metals, Nitrate/Nitrite, Nonylphenol, Temp, & pH

II. Introduction

The water quality assessment (WQA) of Gunnison River near the City of Gunnison Wastewater Treatment Facility (Gunnison WWTF), located in Gunnison County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit factsheet. Figure A-1 contains a map of the study area evaluated as part of this WQA.

FIGURE A-1



The City Of Gunnison WWTF discharges to Gunnison River, which is stream segment COGUUG14. This means the Gunnison and Lower Dolores River Basin, Upper Gunnison Sub-basin, Stream Segment 14. This segment is composed of the "Mainstem of the Gunnison River from its inception at the confluence of the East and Taylor rivers to the inlet of Blue Mesa Reservoir." Stream segment COGUUG14 is classified for Aquatic Life Cold 1, Recreation Class E, Water Supply and Agriculture.

Information used in this assessment includes data gathered from the City Of Gunnison, the Division, the Colorado Division of Water Resources (DWR), Riverwatch, the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA.

III. Water Quality Standards

Narrative Standards

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

Standards for Organic Parameters and Radionuclides

Radionuclides: Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2 Radionuclide Standards	
Parameter	**Picocuries per Liter**
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

Organics: The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because the Gunnison River is classified for Aquatic Life Cold 1, with a water supply designation, the water supply, water + fish, and aquatic life standards apply to this discharge.

Salinity

Regulation 61.8(2)(l) contains requirements regarding salinity for any discharges to the Colorado River Watershed. For industrial dischargers and for the discharge of intercepted groundwater, this is a no-salt discharge requirement. However, the regulation states that this requirement may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 350 tons per year. The Division may permit the discharge of salt upon a satisfactory demonstration that it is not practicable to prevent the discharge of all salt. See Regulation

61.8(2)(l)(i)(A)(1) for industrial discharges and 61.8(2)(l)(iii) for discharges of intercepted groundwater for more information regarding this demonstration.

For municipal dischargers, an incremental increase of 400 mg/l above the flow weighted averaged salinity of the intake water supply is allowed. This may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 366 tons per year. The Division may permit the discharge of salt in excess of the 400 mg/l incremental increase, upon a satisfactory demonstration that it is not practicable to attain this limit. See Regulation 61.8(2)(l)(vi)(A)(1) for more information regarding this demonstration.

In addition, the Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

Temperature

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3a have been assigned to stream segment COGUUG14 in accordance with the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*. Additionally, the parameters in Table A-3b are also being evaluated as they are parameters of concern for this facility type. These parameters are being included based on the numeric standards in Regulation 31.

The Water Quality Control Commission has recently completed a preliminary final action concerning the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*. The proposed changes include addition of temperature standards, update to the zinc table values, and addition of a chronic molybdenum standard and a chronic TVS chromium III standard to bring this segment up to date with Regulation 31.

An amendment to the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins* that becomes effective on March 30, 2013, will change the applicable standards for stream segment COGUUG14. This WQA has been developed in conformance with the water quality standards that will become effective on March 30, 2013, as any permitting action based on this WQA would take effect immediately after (or just prior) to the effective date of this regulation.

Table A-3a In-stream Standards for Stream Segment COGUUG14
Physical and Biological
Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning)
pH = 6.5 - 9 su
E. coli chronic = 126 colonies/100 ml
Temperature April-Oct =18.3° C MWAT and 23.9° C DM
Temperature Nov-March = 9° C MWAT and 13° C DM
Inorganic
Total Ammonia acute and chronic = TVS
Chlorine acute = 0.019 mg/l
Chlorine chronic = 0.011 mg/l
Free Cyanide acute = 0.005 mg/l
Sulfide chronic = 0.002 mg/l
Boron chronic = 0.75 mg/l
Nitrite acute = 0.05 mg/l
Nitrate acute = 10 mg/l
Chloride chronic = 250 mg/l
Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l
Metals
Dissolved Arsenic acute = 340 µg/l
Total Recoverable Arsenic chronic = 0.02 µg/l
Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS
Total Recoverable Trivalent Chromium acute = 50 µg/l
Dissolved Trivalent Chromium chronic = TVS
Dissolved Hexavalent Chromium acute and chronic = TVS
Dissolved Copper acute and chronic = TVS
Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l
Total Recoverable Iron chronic = 1000 µg/l
Dissolved Lead acute and chronic = TVS
Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l
Dissolved Manganese acute and chronic = TVS
Total Recoverable Molybdenum chronic = 160 µg/l
Total Mercury chronic = 0.01 µg/l
Dissolved Nickel acute and chronic = TVS
Dissolved Selenium acute and chronic = TVS
Dissolved Silver acute and Dissolved Silver chronic for trout = TVS
Dissolved Zinc acute and chronic = TVS

Table A-3b Additional Standards Being Evaluated Based on Regulation 31
Nonylphenol acute = 28 µg/l
Nonylphenol chronic = 6.6 µg/l

Table Value Standards and Hardness Calculations

Standards for metals are generally shown in the regulations as Table Value Standards (TVS), and these often must be derived from equations that depend on the receiving stream hardness or species

of fish present; for ammonia, standards are discussed further in Section IV of this WQA. The Classification and Numeric Standards documents for each basin include a specification for appropriate hardness values to be used. Specifically, the regulations state that:

> The hardness values used in calculating the appropriate metal standard should be based on the lower 95% confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used.

Hardness data for Gunnison River near the point of discharge of the Gunnison WWTF were insufficient to conduct a regression analysis based on the low flow. Thirty-five paired flow and hardness data points were available based on a period of record from 02/10/2005 to 08/12/2010, however, none of the data represent low flow conditions. Therefore, the Division's alternative approach to calculating hardness was used, which involves computing a mean hardness.

The mean hardness was computed to be 113 mg/l based on sampling data from USGS Station 383103106594200 located on the Gunnison River at a point ½ mile downstream from the Gunnison WWTF. This hardness value and the formulas contained in the TVS were used to calculate the in-stream water quality standards for metals, with the results shown in Table A-4.

Table A-4

TVS-Based Metals Water Quality Standards for CO0041530

Based on the Table Value Standards Contained in the Colorado Department of Public Health and Environment Water Quality Control Commission *Regulation 35*

Parameter	***In-Stream Water Quality Standard***		***TVS Formula: Hardness (mg/l) as CaCO3 =*** **113**
Cadmium, Dissolved	Acute	1.9 µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.6236)}$
	Chronic	0.47 µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$
Trivalent Chromium, Dissolved	Chronic	82 µg/l	$e^{(0.819(\ln(\text{hardness}))+0.5340)}$
Hexavalent Chromium, Dissolved	Acute	16 µg/l	Numeric standards provided, formula not applicable
	Chronic	11 µg/l	Numeric standards provided, formula not applicable
Copper, Dissolved	Acute	15 µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$
	Chronic	9.9 µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$
Lead, Dissolved	Acute	74 µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-1.46)}]$
	Chronic	2.9 µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-4.705)}]$
Manganese, Dissolved	Acute	3110 µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$
Nickel, Dissolved	Acute	519 µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$
	Chronic	58 µg/l	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$
Selenium, Dissolved	Acute	18.4 µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6 µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	2.5 µg/l	$½\ e^{(1.72(\ln(\text{hardness}))-6.52)}$
	Chronic	0.093 µg/l	$e^{(1.72(\ln(\text{hardness}))-10.51)}$
Zinc, Dissolved	Acute	179 µg/l	$0.978e^{(0.9094(\ln(\text{hardness}))+0.9095)}$
	Chronic	135 µg/l	$0.986\ e^{(0.9094(\ln(\text{hardness}))+0.6235)}$

Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List

This stream segment is not listed on the Division's 303(d) list of water quality impacted streams and is not on the monitoring and evaluation list.

IV. Receiving Stream Information

Low Flow Analysis

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

To estimate the low flows at the Gunnison WWTF discharge point, USGS Gage Station 09114500 (Gunnison River near Gunnison, CO) was used. This station is located approximately four miles upstream of the Gunnison WWTF. Because the Tomichi Creek flows into the Gunnison River after the Gunnison River USGS gage station and before the Gunnison WWTF discharge location, contributions from Tomichi Creek were also included. USGS Gage Station 09119000 (Tomichi Creek at Gunnison, CO) is located approximately three miles upstream of the confluence with the Gunnison River and provides a representative measurement of the contributed flow to the Gunnison River from Tomichi Creek because there are no diversions or confluences of significance between the flow gage and the confluence with the Gunnison River.

Nine diversion ditches, the Kelmel Owens No 1, Kelmel Owens No 2, Goodwin Knox, April ditch, Seventy Five ditch, Thompson ditch, Frank Adams No 2, George Andrew No 1, and the Browning ditch located between USGS Gage Station 09114500 and the Gunnison WWTF discharge point, had to be evaluated. A tenth diversion, the Frank Adams No 1 ditch also withdraws water from the Gunnison River between the USGS gage station and the Gunnison discharge location but was not evaluated because, according to discussions with local water commissioners most of the water withdrawn by the Frank Adams No 1 ditch, returns to the Gunnison River upstream of the discharge point.

Daily diversion flow data for Kelmel Owens No 1, Kelmel Owens No 2, Goodwin Knox, April ditch, Seventy Five ditch, Thompson ditch, Frank Adams No 2, George Andrew No 1, and the Browning ditch were obtained from the DWR Colorado Decision Support Systems and were deducted from the sum of the daily flows obtained from USGS Gage Station 09114500 and USGS Gage Station 09119000.

Flow data from January 1, 2000 through November 28, 2012 were available from the two USGS gage station. Flow data from April 2000 through October 2011 were available for the diversions. The gage station, diversions, and time frames were deemed the most accurate and representative of current flows and were therefore used in this analysis.

Based on the low flow analysis described above, the upstream low flows available to the City Of Gunnison WWTF were calculated and are presented in Table A-5.

Table A-5

Low Flows for Gunnison River at the City Of Gunnison WWTF

Low Flow (cfs)	*Annual*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
1E3 Acute	107	206	166	153	221	233	249	215	107	107	179	173	187
7E3 Chronic	144	218	173	170	243	248	259	215	144	144	179	227	226
30E3 Chronic	179	218	180	180	243	298	296	215	179	179	179	239	231

During the months of July and October, the acute low flow calculated by DFLOW exceeded the chronic low flow. In accordance with Division standard procedures, the acute low flow was thus set equal to the chronic low flow for these months.

The ratio of the low flow of Gunnison River to the Gunnison WWTF design flow is 28:1.

Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the water quality based effluent limitations (WQBELs) based on this available capacity. In addition, the amount of assimilative capacity may be reduced by T&E implications.

For this facility, 100% of the available assimilative capacity may be used as the result of a winter field study indicates that the physical mixing zone is smaller than the regulatory mixing zone, and

the discharge is not to a T&E stream segment, and is not expected to have an influence on any of the other factors listed above.

Ambient Water Quality

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). Ambient water quality is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable.

To conduct an assessment of the ambient water quality upstream of the Gunnison WWTF, data were gathered from Division Station 10203 (Gunnison River below Gunnison) located approximately ½ mile upstream from the facility. Data were available for a period of record from January 2001 through September 2010. A summary of the upstream data from this source is presented in Table A-6.

Table A-6

Ambient Water Quality for Gunnison River

Parameter	*Number of Samples*	*15th Percentile*	*50th Percentile*	*85th Percentile*	*Mean*	*Maximum*	*Chronic Stream Standard*	*Notes*
Temp (°C)	45	0.25	8.9	15	7.7	19	NA	
pH (su)	45	8	8.3	8.6	8.2	8.9	6.5-9	
E. coli (#/100 ml)	42	1	12	74	10	2419	126	1, 2
Nitrate as N (mg/l)	27	0	0	0	0.003	0.08	10	2
Total Inorganic Nitrogen (mg/l)	27	0	0	0.04	0.016	0.08	NA	2
NH_3 as N, Tot (mg/l)	45	0	0	0.04	0.012	0.07	TVS	2
As, Dis (µg/l)	19	0	0	0	0	0	340	2
Cd, Dis (µg/l)	45	0	0	0	0.042	1	0.47	2
Cu, Dis (µg/l)	45	0	0	0	0.2	6	9.9	2
Fe, Dis (µg/l)	45	26	40	79	48	120	300	
Fe, TR (µg/l)	45	84	160	574	306	2000	1000	
Pb, Dis (µg/l)	45	0	0	0	0.82	13	2.90	2
Mn, Dis (µg/l)	45	10	15	25	18	49	50	
Se, Dis (µg/l)	45	0	0	0	0.024	1.1	4.6	2
Ag, Dis (µg/l)	17	0	0	0	0	0	0.093	2
Zn, Dis (µg/l)	45	0	0	11	5.1	53	135	2
Hardness as $CaCO_3$ (mg/l)	35	98	110	129	113	134	NA	

Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.

Note 2: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

V. Facility Information and Pollutants Evaluated

Facility Information

The Gunnison WWTF is located at T49N, R1W, SE ¼, SE ¼, S8; 524 County Road 32 in Gunnison, CO; at 38° 31' 40" latitude North and 106° 59' 31" longitude West in Gunnison County. The current design capacity of the facility is 4.2 MGD (6.5 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

An assessment of Division records indicate that there are no other facilities with individual permit discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Other facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility are covered by general permits and have limitations set at the water quality standards. These facilities were not modeled in

this WQA as they have a minimal impact on the ambient water quality. Other facilities were located more than twenty miles from the Gunnison WWTF and thus were not considered.

Note that due to the intermittent nature of stormwater discharges, and that these types of discharges do not typically occur at low flow conditions, they are not considered in this WQA.

Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit factsheet.

There are no site-specific in-stream water quality standards for BOD_5 or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Nitrate/Nitrite
- Ammonia
- Temperature
- Nonylphenol
- Metals and Cyanide

It is the Division's standard procedure to consider metals and cyanide as potential pollutants of concern for all major domestic WWTFs.

According to the *Rationale for Classifications, Standards and Designations of the Gunnison and Lower Dolores River*, stream segment COGUUG14 is designated a water supply because the Gunnison County W&SD withdraws water from the Gunnison River and the City of Gunnison withdraws water from a well under the influence of surface water in the summer for domestic water supplies. These water supply intakes are located upstream of the discharge location, however, just downstream from the facility's discharge, the Gunnison River enters Blue Mesa reservoir, which is an actively used water supply. Curecanti National Recreation Area – Elk Creek Campground withdraws water from Blue Mesa Reservoir for domestic water supply.. Thus, the nitrate standard, which is applied at the point of intake to a water supply, is further evaluated as part of this WQA. Also, chronic dissolved manganese, sulfate, and dissolved iron, which are for water supply, are also evaluated.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of Gunnison River near the Gunnison WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)
Q_2 = Average daily effluent flow (design capacity)
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = In-stream background pollutant concentrations at the existing quality
M_2 = Calculated WQBEL
M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

The upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85th percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50th percentile. For pathogens such as fecal coliform and *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

Calculation of WQBELs

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, M_2, are set forth in Table A-7a for the chronic WQBELs and A-7b for the acute WQBELs.

Chlorine: There are no point sources discharging total residual chlorine within one mile of the Gunnison WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.

***E. coli*:** For *E. coli*, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean limit and also includes maximum limits of 2,000 colonies per 100 ml (30-day geometric mean) and 4,000 colonies per 100 ml (7-day geometric mean). This 2000 colony limitation also applies to discharges to ditches.

Temperature:
The 7E3 low flow is 144, resulting in a dilution ratio (7E3 low flow to effluent) of 22:1. As the discharge is from a Domestic WWTF where the available dilution ratio is > 10:1, in accordance with the Division's Temperature Policy, no temperature limitations are required.

Nitrate / Total Inorganic Nitrogen (T.I.N.): An acute nitrate standard of 10 mg/l is assigned to this segment, and is intended to be applied at the nearest downstream water intake, which is located in the Blue Mesa Reservoir downstream from the Gunnison WWTF. Because nitrite and ammonia can also form nitrate, compliance with the nitrate standard is achieved through imposition of a Total Inorganic Nitrogen (T.I.N.) limit. T.I.N. effectively measures nitrate and its precursors including nitrite and ammonia.

To determine the background concentration for Total Inorganic Nitrogen for use in the mass balance equation, same day samples of the ambient data for ammonia, nitrite and nitrate (or nitrite + nitrate) were added together to calculate the T.I.N. The 85th percentile of this summed data was calculated and used as the ambient water quality for T.I.N.

Table A-7a

Chronic WQBELs

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2
E. coli (#/100 ml)	179	6.5	185.5	10	126	***3320***
TRC (mg/l)	179	6.5	185.5	0	0.011	***0.31***
As, TR (µg/l)	179	6.5	185.5	0	0.02	***0.57***
Cd, Dis (µg/l)	179	6.5	185.5	0	0.47	***13***
Cr+3, Dis (µg/l)	179	6.5	185.5	0	82	***2340***
Cr+6, Dis (µg/l)	179	6.5	185.5	0	11	***314***
Cu, Dis (µg/l)	179	6.5	185.5	0	9.9	***283***
Fe, Dis (µg/l)	179	6.5	185.5	79	300	***6386***
Fe, TR (µg/l)	179	6.5	185.5	160	1000	***24132***
Pb, Dis (µg/l)	179	6.5	185.5	0	2.9	***83***
Mn, Dis (µg/l)	179	6.5	185.5	25	50	***738***
Mo, TR (µg/l)	179	6.5	185.5	0	160	***4566***
Hg, Tot (µg/l)	179	6.5	185.5	0	0.01	***0.29***
Ni, Dis (µg/l)	179	6.5	185.5	0	58	***1655***
Se, Dis (µg/l)	179	6.5	185.5	0	4.6	***131***
Ag, Dis (µg/l)	179	6.5	185.5	0	0.093	***2.7***
Zn, Dis (µg/l)	179	6.5	185.5	11	135	***3550***
Nonylphenol (µg/l)	179	6.5	185.5	0	6.6	***188***

Table A-7b

Acute WQBELs

Parameter	Q_1 (cfs)	Q_2 (cfs)	Q_3 (cfs)	M_1	M_3	M_2
TRC (mg/l)	107	6.5	113.5	0	0.019	***0.33***
Nitrate/TIN as N (mg/l)	107	6.5	113.5	0.04	10	***174***
Nitrite as N (mg/l)	107	6.5	113.5	0	0.05	***0.87***
As, Dis (µg/l)	107	6.5	113.5	0	340	***5937***
Cd, Dis (µg/l)	107	6.5	113.5	0	1.9	***33***
Cr+3, TR (µg/l)	107	6.5	113.5	0	50	***873***
Cr+6, Dis (µg/l)	107	6.5	113.5	0	16	***279***
Cu, Dis (µg/l)	107	6.5	113.5	0	15	***262***
CN, Free (µg/l)	107	6.5	113.5	0	5	***87***
Pb, Dis (µg/l)	107	6.5	113.5	0	74	***1292***
Mn, Dis (µg/l)	107	6.5	113.5	25	3110	***53894***
Ni, Dis (µg/l)	107	6.5	113.5	0	519	***9063***
Se, Dis (µg/l)	107	6.5	113.5	0	18.4	***321***
Ag, Dis (µg/l)	107	6.5	113.5	0	2.5	***44***
Zn, Dis (µg/l)	107	6.5	113.5	11	179	***2945***
Nonylphenol (µg/l)	107	6.5	113.5	0	28	***489***

Ammonia: The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Temperature and corresponding pH data sets and Ammonia data reflecting upstream ambient receiving water conditions were available for Gunnison River from Division Station 10203 (Gunnison River below Gunnison) located approximately ½ mile upstream from the facility. The data, reflecting a period of record from January 2001 through September 2010, were used to establish the average headwater conditions in the AMMTOX model. Effluent pH and temperature data were also available from the Gunnison WWTF and were used to establish the average facility contributions in the AMMTOX model.

Default setpoints were used to run the AMMTOX Reach model because available pH & temperature data needed to run the AMMTOX Recur model to establish setpoints, had intervals greater than 30 days. The Recur model recommends not running the model when data intervals are greater than 30 days.

The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Gunnison WWTF are presented in Table A-8.

Table A-8

AMMTOX Results for Gunnison River at the City Of Gunnison WWTF

Design of 4.2 MGD (6.5 cfs)

Month	*Total Ammonia Chronic (mg/l)*	*Total Ammonia Acute (mg/l)*
January	19	34
February	18	31
March	16	27
April	23	39
May	31	49
June	29	50
July	17	44
August	16	27
September	17	25
October	15	27
November	22	30
December	20	30

VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*, stream segment COGUUG14 is Undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

Introduction to the Antidegradation Process

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of September 30, 2000, and is described in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts, and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

Significance Tests for Temporary Impacts and Dilution

This is not a temporary discharge and therefore exclusion based on a temporary discharge cannot be granted and the AD evaluation must continue.

The ratio of the chronic (30E3) low flow to the design flow is 28:1, and is less than the 100:1 significance criteria. Therefore this facility is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

New or Increased Impact and Non Impact Limitations (NILs)

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings verses the concentrations and loadings as of September 30, 2000, needs to occur. If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.

Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete. As the NIL is typically greater than the ADBAC, and is therefore the chosen limit, the Division will typically conclude the AD evaluation after determining the NIL. Where the NILs are very stringent, or upon request of a permittee, the Division will calculate both the NIL and the AD limitation so that the limitations can be compared and the permittee can determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit).

The non impact limit (NIL) is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). The NIL is calculated as the September 2000 loading, divided by the new design flow, and divided by a conversion factor of 8.34. If there is no change in design flow, then the NIL is equal to the September 2000 permit limitation.

If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis. Note that if there is a change in design flow, the implicit limit/loading is subject to recalculation based on the new design flow. For parameters that are undisclosed by the permittee, and unknown to the Division to be present, an implicit limitation may not be recognized.

This facility was in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. As the design flow for this facility is the same as it was in September 2000, the NILs are equal to the permit limitations as of September 2000.

For total residual chlorine, the limitations as of September 2000 were used in the evaluation of new or increased impacts. For ammonia, the limitation as of November 2000 was used.

For *E. coli*, fecal coliform limit from this timeframe was used to determine an implicit limitation. In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform.

For nitrate, nitrite, total recoverable arsenic, dissolved cadmium, total recoverable trivalent chromium, dissolved copper, total recoverable iron, dissolved lead, dissolved manganese, total mercury, dissolved nickel, dissolved silver and dissolved zinc, data prior to 2000 were not available. Therefore data from January 2007 through September 2012 were determined to be adequate and were used to determine the implicit limitations.

For dissolved arsenic, dissolved trivalent chromium, dissolved hexavalent chromium, free cyanide, dissolved iron, total recoverable molybdenum, dissolved selenium and nonylphenol, there are no effluent data available and therefore, the Division will include monitoring requirements in the permit so that data can be collected in order to make such a determination of an implicit limit.

Calculation of Loadings for New or Increased Impact Test

The equations for the loading calculations are given below. Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the AD review; however, where there is only an acute standard, the acute standard should be used. Thus, the chronic low flows will be used later in this AD evaluation for all parameters with a chronic standard, and the acute low flows will be used for those parameters with only an acute standard.

$$\textit{Previous permit load} = M_{permitted}\,(mg/l) \times Q_{permitted}\,(mgd) \times 8.34$$
$$\textit{New WQBELs load} = M_2\,(mg/l) \times Q_2\,(mgd) \times 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit (or implicit limit) **(mg/l)**
$Q_{permitted}$ = design flow as of September 2000 **(mgd)**
Q_2 = current design flow (same as used in the WQBEL calculations)
M_2 = new WQBEL concentration **(mg/l)**
8.34 = unit conversion factor

Table A-9 shows the results of these calculations and the determination of a new or increased impact.

Table A-9

Determination of New or Increased Impacts

Pollutant	*Sept 2000 Permit Limit*	*Sept 2000 Permit Load (lbs/day)*	*NIL*	*New WQBEL*	*New WQBEL Load (lbs/day)*	*New or Increased Impact*
E. coli (#/100 ml)	1920	67254	1920	3320	116293	Yes
TRC (mg/l)	0.06	2.1	0.06	0.31	11	Yes
Nitrate/TIN as N (mg/l)	NA	NA	NA	174	6130	Yes
Nitrite as N (mg/l)	NA	NA	NA	0.87	30	Yes
NH_3, Tot (mg/l) Jan	4	140	4.0	19	666	Yes
NH_3, Tot (mg/l) Feb	6.4	224	6.4	18	631	Yes
NH_3, Tot (mg/l) Mar	13	455	13.0	16	560	Yes
NH_3, Tot (mg/l) Apr	16	560	16.0	23	806	Yes
NH_3, Tot (mg/l) May	19.5	683	19.5	31	1086	Yes
NH_3, Tot (mg/l) Jun	9.8	343	9.8	29	1016	Yes
NH_3, Tot (mg/l) Jul	7.7	270	7.7	17	595	Yes
NH_3, Tot (mg/l) Aug	6.2	217	6.2	16	560	Yes
NH_3, Tot (mg/l) Sep	5.4	189	5.4	17	595	Yes
NH_3, Tot (mg/l) Oct	4.6	161	4.6	15	525	Yes
NH_3, Tot (mg/l) Nov	14.4	504	14.4	22	771	Yes
NH_3, Tot (mg/l) Dec	6.9	242	6.9	20	701	Yes
As, TR (µg/l)	NA	NA	1.5	0.57	0.02	No
As, Dis (µg/l)	NA	NA	NA	5937	208	Yes
Cd, Dis (µg/l)	NA	NA	1.4	13	0.46	Yes
Cr+3, TR (µg/l)	NA	NA	1.5	873	31	Yes
Cr+3, Dis (µg/l)	NA	NA	NA	2340	82	Yes
Cr+6, Dis (µg/l)	NA	NA	NA	314	11	Yes
Cu, Dis (µg/l)	NA	NA	65	283	9.9	Yes
CN, Free (µg/l)	NA	NA	NA	87	3	Yes
Fe, Dis (µg/l)	NA	NA	NA	6386	224	Yes
Fe, TR (µg/l)	NA	NA	1160	24132	845	Yes
Pb, Dis (µg/l)	NA	NA	40	83	2.9	Yes
Mn, Dis (µg/l)	NA	NA	48	738	26	Yes
Mo, TR (µg/l)	NA	NA	NA	4566	160	Yes
Hg, Tot (µg/l)	NA	NA	1.5	0.29	0.01	No
Ni, Dis (µg/l)	NA	NA	20	1655	58	Yes
Se, Dis (µg/l)	NA	NA	NA	131	4.6	Yes
Ag, Dis (µg/l)	NA	NA	0.1	2.7	0.095	Yes
Zn, Dis (µg/l)	NA	NA	110	3550	124	Yes
Nonylphenol (µg/l)	NA	NA	NA	188	6.6	Yes

As shown in Table A-9, there are no new or increased impacts to the receiving stream based on the new WQBELS for As(TR) and Hg(Tot). For these parameters the AD evaluation is complete and the WQBELs are the final result of this WQA.

For the rest of the parameters there are new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the NIL's or ADBAC's. Normally, the Division would assign the NILs as permit limitations, or prescribe monitoring to determine the appropriate implicit limitations as necessary, however, in this case, some of the NILs are very stringent and therefore the Division will automatically calculate the ADBACs for comparison.

The final two significance determination tests (bioaccumulative and concentration) need to be applied, to determine if AD limits are applicable. For the bioaccumulative test, the determination of the baseline water quality (BWQ), the baseline water quality loading (BWQload), the threshold load (TL) and the threshold load concentration (TL conc) needs to occur. For the concentration test, the BWQ, significant concentration thresholds (SCT) and antidegradation based average concentrations (ADBACs) need to be calculated. These calculations are explained in the following sections, and each significance determination test will be performed as the necessary calculations are complete. The AD low flow may also need to be calculated when determining the BWQ for an existing discharger (as of Sept 2000) when upstream water quality data are used.

Determination of Baseline Water Quality (BWQ)

The BWQ is the ambient condition of the water quality as of September 30, 2000. The BWQ defines the baseline low flow pollutant concentration, and for bioaccumulative toxic pollutants, the baseline load. The BWQ is to take into account the influence of the discharger if the discharge was in place prior to September 30, 2000. In such a case, data from a downstream location should be used to determine the BWQ. If only upstream data is available, then a mass balance equation may be applied, using the facilities effluent data to determine the BWQ. If the discharge was not present prior to September 30, 2000, then the influence of that discharge would not be taken into account in determining the BWQ. If the BWQ has already been determined in a previous WQA AD evaluation, it may not need to be recalculated as the BWQ is the water quality as of September 30, 2000, and therefore should not change unless additional data is obtained or the calculations were in error.

The BWQ concentrations were correctly determined for all potential pollutants of concern (except nonylphenol and molybdenum of which there are no ambient data) as part of a previous WQA (WQA CO0041530, 02/17/2006). In the absence of data, the BWQ have been assumed to be zero. These are summarized in Table A-10a.

Table A-10a

BWQ Concentrations Based on Previous Determinations

Pollutant	*BWQ*	*WQS*
E. coli (#/100 ml)	20	126
TRC (mg/l)	0	0.011
Nitrate as N (mg/l)	0.6	10
As, TR (µg/l)	0	0.02
As, Dis (µg/l)	0	340
Cd, Dis (µg/l)	0	0.47
Cr+3, TR (µg/l)	0	50
Cr+3, Dis (µg/l)	0	82
Cr+6, Dis (µg/l)	0	11
Cu, Dis (µg/l)	2.7	9.9
CN, Free (µg/l)	0	5
Fe, Dis (µg/l)	79	300
Fe, TR (µg/l)	304	1000
Pb, Dis (µg/l)	0	2.9
Mn, Dis (µg/l)	20	50
Hg, Tot (µg/l)	0.00014	0.01
Ni, Dis (µg/l)	0	58
Se, Dis (µg/l)	0	4.6
Ag, Dis (µg/l)	0	0.093
Zn, Dis (µg/l)	18	138

The BWQ concentrations for total ammonia were determined by the downstream ambient concentration from USGS Station 383103106594200 during the Ad period of record from January 1995 through September 2000. These are shown in Table A-10b

Table A-10b

BWQ Concentrations for Ammonia, Based on Previous Determinations

Pollutant	*BWQ*
NH_3, Total (mg/l) Jan	0.010
NH_3, Total (mg/l) Feb	0.010
NH_3, Total (mg/l) Mar	0.010
NH_3, Total (mg/l) Apr	0.010
NH_3, Total (mg/l) May	0.010
NH_3, Total (mg/l) Jun	0.010
NH_3, Total (mg/l) Jul	0.010
NH_3, Total (mg/l) Aug	0.010
NH_3, Total (mg/l) Sep	0.010
NH_3, Total (mg/l) Oct	0.010
NH_3, Total (mg/l) Nov	0.010
NH_3, Total (mg/l) Dec	0.010

Bioaccumulative Significance Test

This section has been omitted because parameters associated with the bioaccumulative significance test such as mercury, the WQBEL has been determined to be the final result of the WQA as explained above.

Significant Concentration Threshold

The SCT is defined as the BWQ plus 15% of the baseline available increment (BAI), and is calculated by the following equation:

$$SCT = (0.15 \times BAI) + BWQ$$

The BAI is the concentration increment between the baseline water quality and the water quality standard, expressed by the term (WQS – BWQ). Substituting this into the SCT equation results in:

$$SCT = 0.15 \times (WQS-BWQ) + BWQ$$

Where,

WQS = Chronic standard or, in the absence of a chronic standard, the acute standard
BWQ = Value from Table A-10a

When the BWQ concentration is equal to zero, the following equation results:

$$SCT = 0.15 \times WQS$$

The AMMTOX model is used to determine the SCTs for ammonia. Because the new ammonia standard is based on a function of the pH and temperature of the receiving stream, the WQS changes moving downstream from a discharge point. The BWQ and the SCT also change moving downstream. The AMMTOX model calculates these values for every tenth of a mile, for up to 20 miles. Therefore, it is impractical to show the SCTs for every part of the stream for all 12 months. These values are available in the AMMTOX model, if requested.

Determination of the Antidegradation Based Average Concentrations

Antidegradation based average concentrations (ADBACs) are determined for all parameters except ammonia, by using the mass-balance equation, and substituting the SCT in place of the water quality standard, as shown in the following equation:

$$ADBAC = \frac{SCT \times Q_3 - M_1 \times Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3 based on either the chronic or acute standard)
Q_2 = Current design capacity of the facility
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = Current ambient water quality concentration (From Section III)
SCT = Significant concentration threshold

The ADBACs were calculated using the SCTs, and are set forth in Table A-11a.

ADBACs for total ammonia are calculated by substituting the SCT in place of the chronic standard in the AMMTOX model, which generates monthly ADBACs as shown in Table A-11b.

Table A-11a

SCTs and ADBACs

Pollutant	*Q_1(cfs)*	*Q_2 (cfs)*	*Q_3 (cfs)*	*M_1*	*SCT*	*ADBAC*
E. coli (#/100 ml)	179	6.5	185.5	10	36	752
TRC (mg/l)	179	6.5	185.5	0	0.0017	0.049
Nitrate/TIN as N (mg/l)	107	6.5	113.5	0	2.0	35
Nitrite as N (mg/l)	107	6.5	113.5	0	0.0075	0.13
As, Dis (µg/l)	107	6.5	113.5	0	51	891
Cd, Dis (µg/l)	179	6.5	185.5	0	0.071	2
Cr+3, TR (µg/l)	107	6.5	113.5	0	7.5	131
Cr+3, Dis (µg/l)	179	6.5	185.5	0	12	342
Cr+6, Dis (µg/l)	179	6.5	185.5	0	1.7	49
Cu, Dis (µg/l)	179	6.5	185.5	0	3.8	108
CN, Free (µg/l)	107	6.5	113.5	0	0.75	13
Fe, Dis (µg/l)	179	6.5	185.5	79	112	1021
Fe, TR (µg/l)	179	6.5	185.5	160	408	7238
Pb, Dis (µg/l)	179	6.5	185.5	0	0.44	13
Mn, Dis (µg/l)	179	6.5	185.5	25	25	25
Mo, TR (µg/l)	179	6.5	185.5	0	24	685
Ni, Dis (µg/l)	179	6.5	185.5	0	8.7	248
Se, Dis (µg/l)	179	6.5	185.5	0	0.69	20
Ag, Dis (µg/l)	179	6.5	185.5	0	0.014	0.4
Zn, Dis (µg/l)	179	6.5	185.5	11	36	724
Nonylphenol (µg/l)	179	6.5	185.5	0	0.99	28

Table A-11b

ADBACs for Ammonia

Pollutant	*Monthly ADBAC*
NH_3, Total (mg/l) Jan	2.9
NH_3, Total (mg/l) Feb	2.8
NH_3, Total (mg/l) Mar	2.6
NH_3, Total (mg/l) Apr	3.5
NH_3, Total (mg/l) May	4.9
NH_3, Total (mg/l) Jun	4.4
NH_3, Total (mg/l) Jul	2.8
NH_3, Total (mg/l) Aug	2.4
NH_3, Total (mg/l) Sep	2.6
NH_3, Total (mg/l) Oct	2.2
NH_3, Total (mg/l) Nov	3.3
NH_3, Total (mg/l) Dec	3.0

Concentration Significance Tests

The concentration significance determination test considers the cumulative impact of the discharges over the baseline condition. In order to be insignificant, the new or increased discharge may not increase the actual instream concentration by more than 15% of the available increment over the baseline condition. The insignificant level is the ADBAC calculated in Tables A-11a and A-11b above. If the new WQBEL concentration is greater than the ADBAC, an AD limit would be applied. This comparison is shown in Tables A-12a and A-12b (for ammonia).

Table A-12a

Concentration Significance Test

Pollutant	*New WQBEL*	*ADBAC*	*Concentration Test Result*
E. coli (#/100 ml)	3320	752	Significant
TRC (mg/l)	0.31	0.049	Significant
Nitrate/TIN as N (mg/l)	174	35	Significant
Nitrite as N (mg/l)	0.87	0.13	Significant
As, Dis (µg/l)	5937	891	Significant
Cd, Dis (µg/l)	13	2	Significant
Cr, TR (µg/l)	873	131	Significant
Cr+3, TR (µg/l)	873	131	Significant
Cr+3, Dis (µg/l)	2340	342	Significant
Cr+6, Dis (µg/l)	314	49	Significant
Cu, Dis (µg/l)	283	108	Significant
CN, Free (µg/l)	87	13	Significant
Fe, Dis (µg/l)	6386	1021	Significant
Fe, TR (µg/l)	24132	7238	Significant
Pb, Dis (µg/l)	83	13	Significant
Mn, Dis (µg/l)	738	25	Significant
Mo, TR (µg/l)	4566	685	Significant
Ni, Dis (µg/l)	1655	248	Significant
Se, Dis (µg/l)	131	20	Significant
Ag, Dis (µg/l)	2.7	0.4	Significant
Zn, Dis (µg/l)	3550	724	Significant
Nonylphenol (µg/l)	188	28	Significant

Table A-12b

Concentration Significance Test for Ammonia

Pollutant	*New WQBEL*	*ADBAC*	*Concentration Test Result*
NH3, Total (mg/l) Jan	19	2.9	Significant
NH3, Total (mg/l) Feb	18	2.8	Significant
NH3, Total (mg/l) Mar	16	2.6	Significant
NH3, Total (mg/l) Apr	23	3.5	Significant
NH3, Total (mg/l) May	31	4.9	Significant
NH3, Total (mg/l) Jun	29	4.4	Significant
NH3, Total (mg/l) Jul	17	2.8	Significant
NH3, Total (mg/l) Aug	16	2.4	Significant
NH3, Total (mg/l) Sep	17	2.6	Significant
NH3, Total (mg/l) Oct	15	2.2	Significant
NH3, Total (mg/l) Nov	22	3.3	Significant
NH3, Total (mg/l) Dec	20	3.0	Significant

For all parameters, the WQBELs are greater than the ADBACs and therefore, the concentration test results in a significance determination, and the antidegradation based effluent limitations (ADBELs) must be determined.

Antidegradation Based Effluent Limitations (ADBELs)

The ADBEL is defined as the potential limitation resulting from the AD evaluation, and may be either the ADBAC, the NIL, or may be based on the concentration associated with the threshold load concentration (for the bioaccumulative toxic pollutants). ADBACs, NILs and TLs have already been determined in the AD evaluation, and therefore to complete the evaluation, a final comparison of limitations needs to be completed.

Note that ADBACs and NILs are not applicable when the new WQBEL concentration (and loading as evaluated in the New and Increased Impacts Test) is less than the NIL concentration (and loading), or when the new WQBEL is less than the ADBAC.

Where an ADBAC or NIL applies, the permittee has the final choice between the two limitations. A NIL is applied as a 30-day average (and the acute WQBEL would also apply where applicable) while the ADBAC would be applied as a 2 year rolling average concentration. For the purposes of this WQA, the Division has made an attempt to determine whether the NIL or ADBAC will apply. The end results of this AD evaluation are in Table A-13, including any parameter that was previously exempted from further AD evaluation, with the final potential limitation identified (NIL, WQBEL or ADBAC).

Table A-13
Final Selection of WQBELs, NILs, and ADBACs

Pollutant	*NIL*	*New WQBEL*	*ADBAC*	*Chosen Limit*
E. coli (#/100 ml)	1920	3320	752	NIL
TRC (mg/l)	0.06	0.31	0.049	NIL
Nitrate/TIN as N (mg/l)	NA	174	35	ADBAC
Nitrite as N (mg/l)	NA	0.87	0.13	ADBAC
NH3 as N, Tot (mg/l) Jan	4	19	2.9	NIL
NH3 as N, Tot (mg/l) Feb	6.4	18	2.8	NIL
NH3 as N, Tot (mg/l) Mar	13	16	2.6	NIL
NH3 as N, Tot (mg/l) Apr	16	23	3.5	NIL
NH3 as N, Tot (mg/l) May	19.5	31	4.9	NIL
NH3 as N, Tot (mg/l) Jun	9.8	29	4.4	NIL
NH3 as N, Tot (mg/l) Jul	7.7	17	2.8	NIL
NH3 as N, Tot (mg/l) Aug	6.2	16	2.4	NIL
NH3 as N, Tot (mg/l) Sep	5.4	17	2.6	NIL
NH3 as N, Tot (mg/l) Oct	4.6	15	2.2	NIL
NH3 as N, Tot (mg/l) Nov	14.4	22	3.3	NIL
NH3 as N, Tot (mg/l) Dec	6.9	20	3	NIL
As, TR (µg/l)	1.5	0.57	NA	WQBEL
As, Dis (µg/l)	NA	5937	891	ADBAC
Cd, Dis (µg/l)	1.4	13	2	ADBAC
Cr+3, TR (µg/l)	1.5	873	131	ADBAC
Cr+3, Dis (µg/l)	NA	2340	342	ADBAC
Cr+6, Dis (µg/l)	NA	314	49	ADBAC
Cu, Dis (µg/l)	65	283	108	ADBAC
CN, Free (µg/l)	NA	87	13	ADBAC
Fe, Dis (µg/l)	NA	6386	1021	ADBAC
Fe, TR (µg/l)	1160	24132	7238	ADBAC
Pb, Dis (µg/l)	40	83	13	NIL
Mn, Dis (µg/l)	48	738	25	NIL
Mo, TR (µg/l)	NA	4566	685	ADBAC
Hg, Tot (µg/l)	1.5	0.29	NA	WQBEL
Ni, Dis (µg/l)	20	1655	248	ADBAC
Se, Dis (µg/l)	NA	131	20	ADBAC
Ag, Dis (µg/l)	0.13	2.7	0.4	ADBAC
Zn, Dis (µg/l)	110	3550	724	ADBAC
Nonylphenol (µg/l)	NA	188	28	ADBAC

For the following parameters, *E. coli*, TRC, ammonia, dissolved lead and dissolved manganese, the NILs have been established for this facility. The NILs were selected as they are less stringent than

the ADBACs. However, the facility has the final choice between the NILs and ADBACs, and if the ADBAC is preferred, the permit writer should be contacted.

For the following parameters, ammonia (January through November), nitrate, nitrite, dissolved arsenic, dissolved cadmium, total recoverable trivalent chromium, dissolved trivalent chromium, dissolved hexavalent chromium, dissolved copper, dissolved iron, total recoverable iron, total recoverable molybdenum, dissolved nickel, dissolved selenium, dissolved silver, dissolved zinc, free cyanide and nonylphenol the ADBACs have been established for this facility. The ADBACs were selected as they are less stringent than the NILs, or perhaps due to the application as a two-year rolling average. However, the facility has the final choice between the NILs and ADBACs, and if the NIL is preferred, the permit writer should be contacted.

Alternatives Analysis

If the permittee does not want to accept an effluent limitation that results in no increased impact (NIL) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable. If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the WQBEL, and therefore the ADBEL would not being applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

VIII. Technology Based Limitations

Federal Effluent Limitation Guidelines

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation 62, the Regulations for Effluent Limitations.

Regulations for Effluent Limitations

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the Gunnison WWTF.

Table A-14 contains a summary of the applicable limitations for pollutants of concern at this facility.

Table A-14

Regulation 62 Based Limitations

Parameter	*30-Day Average*	*7-Day Average*	*Instantaneous Maximum*
BOD_5	30 mg/l	45 mg/l	NA
BOD_5 Percent Removal	85%	NA	NA
TSS, mechanical plant	30 mg/l	45 mg/l	NA
TSS Percent Removal	85%	NA	NA
Total Residual Chlorine	NA	NA	0.5 mg/l
pH	NA	NA	6.0-9.0 s.u.
Oil and Grease	NA	NA	10 mg/l

IX. References

Regulations:

The Basic Standards and Methodologies for Surface Water, Regulation 31, Colorado Department Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins, Regulation No. 35, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2013.

Colorado River Salinity Standards, Regulation 39, CDPHE, WQCC (last update effective 8/30/97)

Regulations for Effluent Limitations, Regulation 62, CDPHE, WQCC, March 30, 2008.

Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93, Colorado Department Public Health and Environment, Water Quality Control Commission, effective April 30, 2010.

Policy and Guidance Documents:

Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

Rationale for Classifications, Standards and Designations of Segments of the Gunnison and Lower Dolores River, Colorado Department Public Health and Environment, Water Quality Control Division, effective March 30, 2013.

Policy Concerning Escherichia coli versus Fecal Coliform, CDPHE, WQCD, July 20, 2005.

Colorado Mixing Zone Implementation Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.